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ABSTRACT

The two papers presented in this document discuss aspects of the computer revolution and its effects on the production of print materials. The papers are addressed to readers who are educators rather than technologists. The first article, entitled "Print," interprets that term broadly to include text development and production, and aspects of typography, publishing, and the use of text by readers. The second article, "The Development of Printed Materials," particularly examines the way new technology affects the development and production of print materials for distance learning. Both papers focus on the same five aspects of the computer revolution affecting text creation and production: (1) the personal terminal; (2) interface concepts; (3) the software revolution in word-processing and editing aids; (4) communications software; and (5) laser printing and document production. The three main stages of print production are authorship, transforming (creative activities which help to change a draft into a form suitable for the reader), and realization (the manufacturing process). As with all other aspects of print, the world of typography and typographic design is profoundly affected by the recent changes in technology. The articles also discuss the ergonomics of use; staff development; and benefits that modern technology and production methods have brought. Contains a 16-item reading list. (AEF)

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Text & Readers Programme

Technical Report #1

The revolution in print technology

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Introduction

The two papers presented here were both written early in 1993 at a time when the technology of print was changing rapidly. These events are the most significant to have taken place in print technology in the half-millennium since the invention of printing with movable type. At the moment the full consequences of this revolution are still somewhat obscure.

Profound changes in technology always force changes in the way people work together, and this affects distance learning systems, whose main investment is in people. This is the main reason why I address the technology and its implications.

The substance of these papers can not be found elsewhere, though I have given some references for further reading. It is extremely difficult to review changes over such a broad field whilst those changes are still in progress, and most people have, perhaps wisely, not attempted the task. My view is that any reasonable map is useful for the explorer in new territory, and in the midst of a technological revolution we are all explorers. If I look back on these papers in ten years' time I shall not expect to find every detail has stood the test of time: but I do hope the general framework will hold up reasonably well.

The two papers are as follows:

❶ an article for the 2nd edition of *The International Encyclopedia of Education* (eds Husen T & Postlethwaite TN) Pergamon Press, Oxford 1994. This article concentrates on the technology, since other articles will deal with textbooks, distance learning, learning from print and so on. Prepared on Qwark XPress® 3.11, output on 7.2 Pro LaserWriter.

❷ a paper presented to the 2nd International Workshop on Distance Education, Havana, Cuba 1993. This paper relates more directly to the business of a distance learning institution, though the technological content is the same. Prepared on Aldus PageMaker 4.0.

Both papers are addressed to readers who are educators rather than technologists. I know that many countries are only at the first stages of these changes, and so to many readers the topics raised will be difficult to appreciate at first. Nevertheless, these changes will sweep the world during the next ten years. There are no revolutions on earth so profoundly insistent as those caused by changes in technology, as we know well in a country which has been so transformed by two centuries of industrialization.

I am profoundly grateful to those colleagues at the Open University who put time aside to comment on my first draft (see end of first article), and to Professor Michael Twyman of the Department of Typography and Graphic Communication at the University of Reading for his wise advice and comments. Despite this care and attention, the passage of time is bound to reveal flaws, for which the responsibility is mine.

Michael Macdonald-Ross
Reader in Textual Communication
Institute of Educational Technology, The Open University
June 1993

Print

Michael Macdonald-Ross
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Introduction

There is a print revolution, and we are right now in the thick of it. As a result, much of what was said in the previous edition about reprography and print production is thoroughly out of date. This article interprets 'print' broadly to include text development and production, and aspects of typography, publishing and the use of texts by readers.

The print and publishing industries include sectors whose circumstances differ greatly, though all are being changed by modern technical innovation, sometimes quite radically.

The main sectors include newspapers, magazines, books, journals, security print, small bureau and in-house print. Much of the latter is not formally published at all.

1 Computer technology The technology now exists to organize all aspects of print from the initial creation of text (including illustrations) to the output (e.g. laser printing) by means of computers.

2 Consequences The use of specialized staff trained in the traditional technology of print is becoming optional. One may choose to make use of such skills but one is not forced to by the circumstances of industrial technology, as used to be the case. This has vast social and organizational consequences.

The revolution in print technology is not just a matter of economics, though economics will drive it forward. The revolution forces a profound rethinking of the way staff co-operate in order to carry out the work.

3 Colour One visible result of new technology is the great increase in colour printing in magazines, newspapers and textbooks. Readers now expect colour as the norm. This trend will continue, as it did in film and television.

4 Media The same revolution is starting to affect the relation between media, to create new media and new combinations of media, although text is usually (and will remain for the foreseeable future) the key medium for educational purposes.

The reasons for the centrality of print lie in the way knowledge is represented and communicated (at any rate, the kind of knowledge usually involved in formal learning), in the economics of print as compared with other media, and in the psychology and ergonomics of learning from print as compared with other media.

From mediæval guilds to modern work-place

The world of print has its roots in the technology of metal type, the late mediæval guilds with their traditions, their division of labour, their system of apprenticeships and their fierce protection of work boundaries. The printing trades unions are their descendants. In publishing there are unions, but they were never so dominant as the print unions.

Since 1980 the situation has changed rapidly, and – one expects – permanently. First of all, much printing is done in-house by organizations that are not print companies. In-house publication now challenges and may outstrip traditional print methods in such countries as the USA and the UK. One has to recognize, however, that much of this work is new print that once might have been typewritten and reproduced rather than printed.

So we see one effect of the print revolution – a huge growth in the quantity of print, an extension of print into areas that were dominated by typewriting or handwriting, and in addition a genuine increase in new types of publication.

The modern print industry has largely shaken off the unions' stifling grip on working practices. This has brought problems as well as benefits.

Training has reduced in quantity and quality, due partly to the loss of trades union influence, and has also become more specialized. Also, some operations have become deskilled.

To survive, the industry has had to change, and those changes are not yet complete. Overall, the commercial print industry is

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viable and even expanding, and is widely used for large-scale publication.

One great change in the print industry has been the loss of composition work (text entry on keyboard). This has been directly caused by the new technology.

Now most text entry and other work up to and including pagination (page make-up) is done in-house by newspaper & magazine pub-lishers, some journal & book publishers, and by some authors or out-workers. Printers are now left with the manufacturing process (turning digital text into print products).

Something similar is happening in the production and publishing of educational materials. One can see three main patterns:

❶ Publishing by traditional publishers using trade print houses. This has continued as before, but with new technology.

❷ In-house creation, transforming, printing and publishing by educational institutions. This is a modern idea made possible – or at any rate, made economic – by the new technology.

❸ In-house development (including writing, text input, editing, design, illustration, typography) followed by the use of outside print houses for manufacturing; also arrangements may be made with commercial publishers for marketing the product.

Much educational material will flow along this route, which is a sensible combination of options 1 and 2.

The computer revolution

The integrating effects of modern computers are profoundly affecting the world of print and its human relationships. Five aspects of the computer revolution affect text creation and production:

1 The personal terminal The advent of the personal terminal (the 'desk-top' revolution) enfranchised the non-specialist worker, and relaxed the stranglehold of central computer departments which had lasted since the 1950s.

2 Interface concepts

Continuing on the same theme, great efforts have been made to design screen displays that are 'user-friendly', and allow non-computer staff to operate sophisticated software. The acronyms WYSIWYG [What You See Is What You Get] and WIMP [Windows, Icons, Mice, Pull-downs] refer to interface concepts of great significance.

WYSIWYG means that text on the screen should mimic the way it appears when printed; this is now partly achieved, though one hopes for further improvement.

WIMP is the acronym for ideas originally developed by Xerox Research Inc. to make sophisticated software easier to use. The purpose is to reduce the burden of rote memory, and make advanced software accessible to users who are not computer specialists. This concept was first applied successfully in commercial practice by Apple Computer Inc, and spread further by Microsoft Corporation.

3 The software revolution The software innovations of special significance are:

❒ the development of word-processing software influenced by typesetting rather than typing.

❒ the development of software that can be used for typographic design and pagination by both professionals and non-professionals.

❒ editing support software of various types is now available. The need for human editing skills will continue, and the range and scope of on-line editing aids will continue to develop.

❒ the development of graphics software that allows the text producer to capture and manipulate graphic images and unite those images with words in an overall page design. This development is backed by such tools as CD-ROMs containing libraries of images, document readers and drawing software.

❒ Adobe PostScript® has become the de facto industry standard for driving laser printers; this has had a catalytic effect on the whole industry.

❒ there are also innovations in the large-scale machinery of the print industry.

These developments have led to a *soft print revolution.*

4 Communications software

Also highly important has been the development of software that makes it easy to link groups of personal terminals together to exchange data and make group-work effective. In addition, telecommunications technology allows one to send information around the world in digital form.

5 Laser printing & document production Laser printers are also computer devices, capable of good quality output in colour: this allows production groups to get a proof of the finished product. This feedback to the creative team has a profound effect on the process of typographic design and pagination. Laser printers are also widely used to output the text for in-house publishing.

Advanced document copiers also accept digital information, may have colour capacity and can carry out simple forms of binding: this is the basis of printing on demand, one of the new options at the binding and packaging stage. Now there are machines capable of complete electronic throughput: capture of electronic text through telelinks or document scanning, then editing and graphic work, then

document production, and finally binding.

Stages of print production

The print revolution has swept away the old technology, and we have electronic throughput from authorship to manufacturing. The process is best considered in three main stages:

1 Authorship Because so many educational texts are now group products, especially any produced by the course team process (one of the UK Open University's key innovations), this stage includes all who take part in planning, writing, commenting and initial revision. It might include other academics, educational technologists, editors, tv producers, tutors, consultants and any others who might influence the content of the work, as contrasted with its presentation.

One recent development that is sure to grow is the use of computers to tie together a group of authors collaborating at a distance. Co-operative or collaborative authoring means that staff from different institutions (perhaps in different countries) will be able to form groups to create learning material for the benefit of all the participating institutions. Only organizational inertia stands in the way of a very widespread use of this idea.

Another innovation is the advent of non-linear writing systems, known collectively as *hypertext*. The value of this software is controversial at present. It has, some think, the flavour of a technological solution in pursuit of a problem; time will tell. We can expect to hear much more of the effect of computers on writing.

At the end of the authorship stage the text is in digital form.

2 Transforming A term to cover those creative activities which help to change a draft into a form suitable for the reader. Transforming includes all the work associated with layout planning, text editing, typographic design, illustration, photography, picture searching and pagination.

Often the work of transforming is organized around a leader with authority to take creative decisions & deploy resources who is, so to speak, the chief transformer. In newspapers this is the chief sub, in book publishing and magazine work the editor, in television the producer, in films the director.

All these settings involve a high degree of teamwork and co-operation between staff with a variety of specialist skills. The production of part-works and illustrated reference works by those publishers known as *book packagers* is another print example of transforming.

The end product of the process of transforming is made-up text, including illustrations and graphics, in digital form, usually on pagination software.

3 Realization This term is used here to cover the manufacturing process whereby, with pages in digital form, an image is produced on paper, plus the binding and finishing work that produces a final product. An alternative term is, simply, *manufacturing*. Traditional terms such as reprography, imposition, presswork, binding and, of course, printing are still widely used; they cover parts of the manufacturing process.

There are many possible ways to get an electronic image onto paper, but for educational materials we usually need to consider only two options:

❶ Output direct from laser printer, or from laser printer plus document copying. Both machines can produce colour images if required. Laser printing is often used in-house for sight of the product during development, and may be used for final production if the print run is relatively short. It is called *printing on demand* when copies are produced to order, rather than printed in bulk and warehoused.

❷ Output on film or bromide by an image-setter for use in an offset lithography process.

The first of these options can easily be done in-house, especially as advanced document copiers can provide a form of binding. The second option can produce a good quality product in the hands of a professional print shop (an external company or an in-house department).

The second route has some advantages. From a professional shop you have access to a wide range of typefaces, and quality machinery which produces text with good resolution and fit of characters. Also, if colour work is required, the commercial house will be more experienced. Lastly, if a traditional sewn binding is required this will have to go out to a specialist binder in any case.

The general opinion is that you go to a professional print house when quality of print is an important consideration, and also when the print run is long enough to make it economic.

The end product of realization is a book or other package as a printed object for readers. This may be followed by other industrial processes such as warehousing, packing and distribution.

Typographic design

As with all other aspects of print, the world of typography and typographic design is profoundly affected by the recent changes in technology.

1 Typefaces There are digital versions of virtually all the classi-

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cal typefaces and many new ones designed on-screen with computer technology. Reference works are available showing typefaces, of which there are thousands.

Of this huge number only a few faces are available on the typical word-processor or pagination software: this is not sufficient for good quality in-house publication. Therefore any organization intending to do in-house publication needs to obtain and install a suitable range of typefaces on their software, or make use of a commercial print shop for its output.

A note of caution. Many typefaces are available in versions which are markedly inferior to the original design. The reasons for this are partly to do with evasion of patents and copyrights, and also the sheer haste of commercial type houses and computer software houses to get products onto the market.

The choice of typefaces for an in-house production system should be made by a professional typographer.

2 Typographic research

The great bulk of typographic research is of little value to the practising typographer. In the first place, the work was mostly done on typefaces designed for letterpress, and recent faces are virtually unresearched.

Rather more serious is the fact that real typographic design involves the balancing of many factors to produce a result that is functional, practical and pleasing. Such a design is a mosaic of interacting parts; no element stands on its own and most elements affect other elements in the design.

There have been few empirical studies of total designs, and the researcher will appreciate that analysis of variance designs are not the solution to this kind of problem.

There is now a rethinking of what kind of empirical study might be of help to practitioners. It does require researchers who are prepared to grasp the basics of typographic design and the manufacturing process, which in the past was rarely the case.

3 Software The typographic designer today works on-screen, often with pagination software. Type design is now also done with software. Each program has its strengths and its weaknesses; it facilitates some things and makes other things difficult.

Therefore, both practical typography and empirical research should take the software as a starting point. We need studies of software-in-use. In this respect we have all moved into a new world.

4 Discourse & typography The typography of educational texts relates to their discourse. This discourse falls into a predictable pattern:

❶ First there is discourse about the subject-matter. This is presented in language, in mathematical or other special notations, and in graphical form such as tables, graphs and diagrams.

❷ Next, there is discourse about the process of learning. This will include all the apparatus of study guides, objectives, questions, feedback, practice examples and so on.

Much of this came from work on programmed learning, and much also came from the common-sense of experienced teachers, textbook writers and editors.

❸ Lastly, there is discourse which helps the reader to find his or her way around the text, which signals where the reader is and also signals the status of the material being read.

These devices include the paragraph, the title page, running heads, the index, page numbers, chapters, and so on. There are also ways of delineating voice or discourse type, signalling dialogue or commentary or in-text questions or places for readers to respond.

Some authors use the term *typographic signalling* (or cueing) for this kind of discourse, but thinking those terms too narrow, Macdonald-Ross & Waller coined the term *access structure* for this discourse, retaining typographic signal as a subsidiary term.

5 Reading strategy & typography Reading is selective: most text is not read sequentially from the beginning to the end, and is not read in total. This is obvious with a newspaper or magazine, but it also happens to be true for educational material. Reading may take place for different purposes, and the same reader may work on a text in a different way at different times.

In education, the performance required of the learner after reading may vary considerably; the rote recall of the old-time schoolroom is a kind of performance now out-of-date even in psychology experiments!

Because a typographic design has to cope with such discourse complexity, and such variety in the tactics & strategy of reading, the design itself tends to be complex, though such complexity may be largely invisible to the reader.

In fact, educational texts are structurally complex when compared to prose works such as novels, but they do not use such a wide range of graphic tools as do mass circulation magazines.

Format

One thing that separates traditional from in-house publishing is the format. Overwhelmingly, in-house publishing uses international page sizes, especially A4.

This choice is rather awkward from the point of view of the reader. The measure of type across the A4 page is rather too long for good legibility if a single column layout is used. Also, the size is not convenient in the hand (that is important, as it affects frequency of use).

In a bookshop, A4 often needs shelving apart from the usual book sizes; it does not sit comfortably on the standard shelf size – indeed A4 books often can't stand up unaided on a shelf. These things can be important for a bookshop. Commercial publishers generally choose a smaller format except for highly illustrated works.

However, a two or three-column layout can work well on A4 (it shortens the measure to acceptable dimensions). There are even some advantages to A4; for example, it is good for highly illustrated works; and in production most machines have an A4 setting.

In general, the ergonomics of use are more important than the convenience of the producer, and from that point of view A4 should not be the first choice.

The international range of paper sizes does offer more acceptable options. A5, half the size of A4, is excellent ergonomically, rather similar to demy 8vo in size. Also there is the international B series, which offers B5, a size somewhat larger than A5. In commercial book publishing, the traditional page sizes are more usual.

Binding & packaging

The options available for binding and packaging are increasing. Much educational material is marketed as packs, which in effect means boxes, slip cases, folders, ring binders and other types of packaging. Inside the pack may be separate sheets, books, video and audiotapes, even computer disks.

Perhaps a third of the Open University courses use this sort of packaging, and in the world of adult seminars and workshops almost all the material is in this form.

However, the traditional book is still a marvellously flexible teaching machine, and for the publisher still the most convenient vehicle for marketing. Soft vs hardback is not absolutely critical, except that soft covers need to be robust for educational use. The real choice is in the heart of the binding – how the pages are joined together.

Below, under ergonomics, I suggest that sewn sections are the key element in a durable binding, a widely acknowledged truth. However, for special purposes other types of binding may be preferred: there is a widespread use of spiral binders and ring binders for computer manuals (though softback books with sewn sections do lie flat and are durable).

The option of printing on demand, mentioned earlier under laser printing, requires caution. Printing on demand makes use of a kind of binding by document copier of which we have at present limited experience (see below, under durability). Yet for some purposes it may be ideal.

Publishing

There is now growing co-operation between book publishers and large educational institutions. Publishers of educational material also play an active role in generating the content, and are innovative in marketing.

❶ There has been much use made of market research by the big textbook publishers in the United States. Their extensive research into college syllabi, their field trials and their use of critiques by experienced and influential teachers, allows them to design books which can be guaranteed in advance to meet the requirements as course-books in leading institutions.

Much of the writing and transforming work for such books are done in-house by the publishers themselves, thus giving them control over the details.

Related to this is the 'mix-'n-match' idea, where a range of chapters is kept on computer, and a selection made, together with some of the instructor's own notes, for each institution that chooses the work as a course-book. This tailor-makes the book for the instructor. Course-books also carry satellites along with them, such as instructors' manuals.

❷ The world's foremost distance learning institution, the UK Open University, has introduced a system of co-publishing after twenty years of publishing its own materials. In this new mode, the OU writes and transforms its own teaching material as it did before, then offers commercial publishers the chance of adding the material to their lists as books available for open sale in bookstores.

Once a deal is struck the OU then gets shared costs, economies of scale and some enhanced quality (for example, a more frequent use of second or four-colour printing). As copyright holder, the University earns royalties, and arranges buy-back of copies for its own students. So far the idea has given benefits to both sides, and in some cases the published books have sold extraordinarily well for academic material.

❸ Much publishing is done on topics that are truly educational, but are not offered in formal educational establishments. In this field part-work publishers

and book packagers are very active. They put capital into the authoring and transforming stages and are astute at tailoring the material to a market.

Book packagers develop multi-language versions which they sell on for marketing to publishers in other countries.

Ergonomics

Perhaps the most under-rated of all print topics is the way books are handled and used by the reader. Here are some considerations:

1 Ease of handling Here weight, size, and ability to open flat are important.

Heavy books affect portability and handling quality; this in turn reduces the readers' options as to where study takes place. One Open University coursebook weighs 2½ kilograms, with more than a thousand pages!

Whilst it is difficult to set hard-and-fast limits, educational material bound in one volume should generally be under 500 gms, with 750 grams as a suggested upper limit. In putting this guideline into practice the choice of paper is critical: there is often a tension between the need for lighter paper and the need for good opacity to reduce show-through.

When faced with huge and weighty course texts students might be well advised to take a tip from Charles Darwin. He used to take a binder's knife to the spine of large books and separate them into three or four sections of modest size, then wrote notes on them.

Large size may cause problems on a desk when room is needed for other sources and notebooks; in particular, landscape format is always apt to cause difficulties on a crowded desk. Large size also affects portability and ease of handling away from the desk. There is a tendency nowadays for page size to get larger, perhaps to accomodate increased use of illustrations, but often for no good reason.

Binding affects ease of opening: where books don't open flat two hands must be used to hold it open, or alternatively the spine must be savagely handled to enforce its opening.

Poor decisions in weight, size and binding are a source of problems for the reader.

2 Durability It is famously true that educational material is hard used, often very hard used. Yet, for relatively minor savings in production cost, educational material is all too often given the least durable binding.

What should be avoided is the kind of 'perfect binding' which results in a shower of pages onto the floor after a short period of hard usage. This kind of binding, in which separate sheets of paper are attached by little more than PVA (poly-vinal adhesive) is quite inappropriate for educational material.

Much superior is the traditional method where sewn sections allow ease of opening, yet are very durable. Advanced document copiers now offer taped hot-melt binding as an option; first experience suggests this is an improvement on older forms of perfect binding, though not so durable as sewn sections.

Other factors in durability are the cover – soft covers should stand up to wear & tear – and the paper. Popular paperback publishing tends to use small type on paper that browns and becomes friable, and perfect binding; obviously such books are less legible and durable than we might wish.

On the other hand, expensive reference works may now be printed on acid-free paper, and sewn and bound securely, thus enhancing their potential life. Some reference works are available as compact disks, satisfactory so long as the amount of reading required is minimal.

3 Legibility The past decade or two has seen a tendency for some educational material to be published with inferior typography, leading to reduction in legibility. The cause of this may be sheer ignorance, or a by-product of technological change, but perhaps more often it is due to false economy by publishers, many of whom do not employ professional typographers as they once might have done.

It cannot be said too often that the most important single requisite of book production is now, as always, good legibility.

Staff development

Staff development is a pressing need of the moment. It takes time to learn how to get the most from the software. Also, these tools are often in the hands of people who may not have enough background in editing, the graphic arts and typography. Every man his own typographer! The idea is anathema, yet few organizations will be able to employ in-house the kind of expertise once found only in top-class publishing houses or magazines.

All this leads to some fundamental questions:

❒ How to give staff some of the skills of editing, design & typography that once took half a lifetime to learn? Training and updating in computer software is also a permanent problem these days. In these fields short courses are only part of the solution: there is a big difference here between acquaintance and mastery.

❒ The next question is how should these renaissance communicators combine in work-teams

and operate to schedule to produce a quality product?

One key idea is that work-teams doing the transforming (see above) should work together in one area, perhaps a large room on a linked group of terminals so as to encourage synergy and teamwork. This is a practice already followed by some highly successful production groups.

❒ Another problem is how to negotiate the changes in working practice in what was a highly trade-unionized setting. The adoption of in-house publishing has made it easier to evade the problem of long-standing craft and union differences.

❒ How best to use specialist consultants in typography, design and computer software is another issue facing management.

One cannot give pat solutions to these problems, but knowing the problems exist is itself an advance.

Benefits of in-house publishing

What are the benefits that modern technology and in-house publishing have brought? Opinions vary, but items on the list include:

❒ improved speed of production once the methodology is mastered.

❒ reduction in costs.

❒ improved control over details.

❒ easy updating, printing on demand, general flexibility.

❒ improved quality via better interaction between creative staff.

❒ offers female employees equal opportunity for employment.

❒ ability to match texts to specific readers or clients.

❒ increasing use of colour and graphics at economic rates.

New media

We are all aware that a great deal of text nowadays is presented on-screen rather than printed. This has the virtue that the text might be united with other modalities. One can unite text and film or cartoon, or text and computer simulation without moving from the personal workstation.

However, multi-media presentation will not get used regularly in education without solutions being found to at least two critical problems:

❶ Ergonomically, screen text is a poor second-best to printed text. Text on screen lacks legibility and is hard to access at speed. And, obviously, screens are less portable than books.

❷ Multi-media screen-based systems are expensive to produce and expensive to make available to the learner.

All in all, one expects a long and healthy future for printed texts in education.

Michael Macdonald-Ross

Further reading

Amato J 1992 Science-literature inquiry as pedagogical practice: technical writing, hypertext, and a few theories; parts I & II. *Computers and Composition* 9: 2, 41-54; 55-69.

Carlson PA 1991 Virtual text and new habits of mind. In H Maurer (ed) *New results and new trends in computer science.* Springer-Verlag, Berlin.

Duffy TM & Waller R (eds) 1985 *Designing Usable Texts.* Academic Press, Orlando FLA & London.

Febvre L & Martin J-P 1976 *The Coming of the Book: the impact of printing 1450-1800.* NLB, London. [transl. of *L'Apparition du Livre,* Editions Albin Michel, Paris 1958.]

Gottschall, EM 1989 *Typographic Communications Today.* MIT Press, Cambridge MA.

Hartley J 1992 *Technology and Writing: readings in the psychology of written communication.* Jessica Kingsley Publishers, London & Philadelphia.

Jeavons T & Beaumont M 1990 *An Introduction to Typography.* Apple Press, London.

Macdonald-Ross M & Waller R 1975 Criticisms, alternatives & tests: a conceptual framework for improving typography. In J Hartley & P Burnhill (eds) special issue on typographical research, *Programmed Learning & Educational Technology,* 12: 75-83.

Macdonald-Ross M & Waller R 1976 The Transformer. In S Greenwood and C Goodacre (eds) *The Penrose Annual* 69: 141-152. Northwood, London.

Sharples M (ed) 1993 *Computer Supported Collaborative Writing.* Springer-Verlag, Berlin.

Tuman M 1992 *Word Perfect: literacy in the computer age.* Falmer Press, London.

Wallis LW 1990 *Modern Encyclopedia of Typefaces 1960-90.* Lund Humphries, London.

Whalley P 1993 An alternative rhetoric for hypertext. In C McKnight, A Dillon & J Richardson (eds) *Hypertext: a psychological perspective.* Ellis Horwood, Chichester.

[Anon] 1991 The London Evening Standard: complete PostScript newspaper. *Seybold Report on Publishing Systems* 21: 2, 3-17. The Seybold Report is an important source for news on print technology: Seybold Publications Inc. PO BOX 644, Media, PA 19063 USA.

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The development of printed materials

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The paper discusses the way new technology affects the development and production of print materials for distance learning.

The computer revolution in print

Modern computer technology is profoundly affecting the world of print and its human relationships. We are at present in the middle of a print revolution, in which computers are used for every stage of print production from the initial act of writing to the final finished product. This revolution - which, of course, is at different stages in different countries - is extremely important because it is not *just* a matter of economics. The print revolution is important because it is changing the way work is done and who does the work, and has subtly shifted perceptions of the kind of work felt to be economic.

The old division of labour between writers, editors, designers, typographers and print craft specialists is breaking down. One is not obliged to use specialized staff trained in the old technology of hot metal; much of the work is being done in-house, inside the educational organization, sometimes inside individual departments or faculties.

This brings many benefits, but also some problems. How do we organize our production so as to achieve the quality we need, whilst minimizing our contact with expensive trade specialists? A new look at training and organization is needed.

Five aspects of the computer revolution affect text creation and production:

1 The personal terminal The advent of the personal terminal (the 'desk-top' revolution) enfranchised the non-specialist worker, and relaxed the stranglehold of central computer departments which had lasted since the 1950s. It enables staff to work directly with the computer without needing to go through an intermediary.

2 Interface concepts Continuing on the same theme, great efforts have been made to design screen displays that are 'user-friendly', and allow non-computer staff to operate sophisticated software. The acronyms WYSIWYG [What You See Is What You Get] and WIMP [Windows, Icons, Mice, Pull-downs] refer to interface concepts of great significance.

WYSIWYG means that text on the screen should mimic the way it appears when printed; this is now partly achieved, though the legibility of text on screen still leaves much to be desired.

WIMP is the acronym for ideas originally developed by Xerox Research to make sophisticated software easier to use. The purpose is to reduce the burden of rote memory, and make advanced software accessible to users who are not computer specialists.

3 The software revolution The software innovations of special significance are:

- sophisticated word-processing software.
- editing support software of various types. The range and scope of on-line editing aids will continue to develop.
- software that can be used for typographic design and pagination (page make-up) by both professionals and non-professionals.
- graphics software that allows the text producer to capture and manipulate graphic images and unite those images with words in an overall page design. This development is backed by such tools as CD-ROMS containing libraries of images, document readers and drawing software.
- Adobe PostScript® has become the *de facto* industry standard for driving laser printers; this has had a catalytic effect on the whole industry.
- there are also innovations in the large-scale machinery of the print industry.

Collectively, these developments have led to a *soft print revolution.*

4 Communications software Also highly important has been the development of software that makes it easy to link groups of personal terminals together to exchange data and make group-work effective. In addition, telecommunications tech-

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nology allows one to send information around the world in digital form.

5 Laser printing & document production Laser printers are also computer devices. They are capable of good quality output in colour, which allows production groups to get a proof of the finished product, and so has a profound effect on the process of typographic design and pagination. Laser printers are also widely used to output the text for in-house publishing.

Advanced *document copiers* also accept digital information, may have colour capacity and can carry out simple forms of binding: this is the basis of *printing on demand*, one of the new options at the binding and packaging stage. Now there are machines capable of *complete electronic throughput:* capture of electronic text through telelinks or document scanning, then editing and graphic work, then document production, and finally binding.

Stages of print production

The print revolution has swept away the old technology, and we have electronic throughput from authorship to manufacturing. The process is best considered in three main stages:

1 Authorship One of the UK Open University's key innovations was to place responsibility for managing the writing process with *course teams* rather than individual academics. There are, of course, precedents, for instance in the production of newspapers and magazines, where the individual always works as a member of a team, not an isolated individual.

The course team includes all who take part in planning, writing, commenting and initial revision of the teaching material. It may include academics, educational technologists, editors, tv producers, tutors, consultants and any others who might influence the content of the work, or who are key to the later stages described below under *transforming*.

The Open University's course team method has proved greatly superior to the traditional university approach (where individual teachers are solely responsible for individual courses), at any rate for the purpose of producing teaching materials in print and other media. For one thing, it is possible for us to bring to bear a wide range of skills, for another, it is possible for us to help staff who are newcomers or who need extra help, and finally we can achieve good co-ordination of content between levels, and between neighbouring courses.

Many open learning systems round the world have copied the UK's system, though there are exceptions who, for various reasons, have chosen other routes. It is a question as to whether any of these other methods has improved on our course team approach. It is also worth considering whether the course team approach should be adopted in traditional universities in order to improve the quality of face-to-face teaching.

One recent development that is sure to grow is the use of computers to tie together a group of authors collaborating at a distance. Co-operative or collaborative authoring using telecommunication links means that staff from different institutions (perhaps in different countries) will be able to form groups to create learning material for the benefit of all the participating institutions. Only organizational inertia stands in the way of a very widespread use of this idea.

Another innovation is the advent of non-linear writing systems, known collectively as *hypertext*. The value of this software is controversial at present. It has, some think, the flavour of a technological solution in pursuit of a problem; time will tell. We can expect to hear much more of the effect of computers on writing.

At the end of the authorship stage the text is in digital form.

2 Transforming is the process of turning a rough draft into a finished product. It covers those creative activities which help to change a draft into a form suitable for the reader. Thus transforming includes all the work associated with layout planning, text editing, typographic design, illustration, photography, picture searching and pagination.

Often the work of transforming is organized around a leader with authority to take creative decisions & deploy resources who is, so to speak, the chief transformer. There are many parallels for this role in media work outside education: in newspapers there is the chief sub, in book publishing and magazine work the editor, in television the producer, in films the director. The production of part-works and illustrated reference works by those publishers known as *book packagers* is another example of transforming.

For distance learning texts the transforming of text material is perhaps best co-ordinated by a educational technologist, whose professional style is to anticipate the needs of the learner as he or she works with the learning material in a course.

In all these settings (newspapers, magazines, part-works, open learning material) the production involves a high degree of teamwork and co-operation between staff with a variety of specialist skills. Since the finished text is an organic whole in which every part may affect many other parts, the working methods must produce integration in the final product. Such integration cannot be so well achieved if the different specialists work separately in differ-

ent departments. They should work together as members of a team, and owe their allegiance to the team task.

These considerations lead one to envisage a large room, or a suite of rooms, in which educational, content, design, editing and other skills are brought together in one place and at one time, thus achieving an ideal integration in the product. Of course, modern computing software does have an integrating effect in any case, which explains how the computer revolution is bringing about changes in working methods that were needed in any event.

The end product of the process of transforming is made-up text, including illustrations and graphics, in digital form, usually on pagination software.

3 Realization This term covers the manufacturing process whereby (with pages already in digital form) an image is produced on paper, plus the binding and finishing work that produces a final product. An alternative term is, simply, *manufacturing*. Traditional terms such as reprography, imposition, presswork, binding and, of course, printing are still widely used; they cover parts of the manufacturing process.

There are many possible ways to get an electronic image onto paper, but for educational materials we usually need to consider only two options:

❶ Output direct from laser printer, or from laser printer plus document copying. It is called *printing on demand* when copies are produced to order, rather than printed in bulk and warehoused.

❷ Output on film or bromide by an image-setter for use in an offset lithography process.

The first of these options can easily be done in-house, especially as advanced document copiers can provide a form of binding. The second option can produce a good quality product in the hands of a professional print shop (an external company or an in-house department).

The second route has some advantages. From a professional shop you have access to a wide range of typefaces, and quality machinery which produces text with good resolution and fit of characters. Also, if colour work is required, the commercial house will be more experienced. Lastly, if a traditional sewn binding is required this will have to go out to a specialist binder in any case.

The general opinion is that you go to a professional print house when quality of print is an important consideration, and also when the print run is long enough to make it economic.

The end product of realization is a book or other package as a printed object for readers. This may be followed by other industrial processes such as warehousing, packing and distribution.

Typographic design

As with all other aspects of print, the world of typography and typographic design is profoundly affected by the recent changes in technology.

1 Typefaces There are digital versions of virtually all the classical typefaces and many new ones designed on-screen with computer technology. Reference works are available showing typefaces, of which there are thousands.

Of this huge number only a few faces are available on the typical word-processor or pagination software: this is not sufficient for good quality in-house publication. Therefore any organization intending to do in-house publication needs to obtain and install a suitable range of typefaces on their software, or make use of a commercial print shop for its output.

A note of caution. Many typefaces are available for computer in versions which are markedly inferior to the original design. The reasons for this are partly to do with evasion of patents and copyrights, and also the sheer haste of commercial type houses and computer software houses to get products onto the market.

The choice of typefaces for an in-house production system should be made by a professional typographer.

2 Software The typographic designer today works on-screen, often with pagination software. Type design is now also done with software.

Each program has its strengths and its weaknesses; it facilitates some things and makes other things difficult. Therefore, both practical typography and empirical research should take the software as a starting point. We need studies of software-in-use. In this respect we have all moved into a new world.

3 Discourse & typography The typography of educational texts relates to their discourse. This discourse falls into a predictable pattern:

❶ First there is discourse about the subject-matter. This is presented in language, in mathematical or other special notations, and in graphical form such as tables, graphs and diagrams.

❷ Next, there is discourse about the process of learning. This will include all the apparatus of study guides, objectives, questions, feedback, practice examples and so on.

Much of this came from work on programmed learning, and much also came from the commonsense of experienced teachers, textbook writers and editors.

❸ Lastly, there is discourse which helps the reader to find his or her way around the text, which signals where the reader is and also signals the status of the material being read.

These devices include the paragraph, the title page, running heads, the index, page numbers, chapters, and so on. There are also ways of delineating voice or discourse type, signalling dialogue or commentary or in-text questions or places for readers to respond.

Some authors use the term *typographic signalling* (or cueing) for this kind of discourse, but thinking those terms too narrow, Macdonald-Ross & Waller coined the term *access structure* for this discourse, retaining typographic signal as a subsidiary term.

4 Reading strategy & typography Reading is selective: most text is not read sequentially from the beginning to the end, and is not read in total. This is obvious with a newspaper or magazine, but it also happens to be true for educational material. Reading may take place for different purposes, and the same reader may work on a text in a different way at different times.

In education, the performance required of the learner after reading may vary considerably; the rote recall of the old-time school-room is a kind of performance now out-of-date even in psychology experiments!

Because a typographic design has to cope with such discourse complexity, and such variety in the tactics & strategy of reading, the design itself tends to be complex, though such complexity may be largely invisible to the reader.

In fact, educational texts are structurally complex when compared to prose works such as novels, but they do not use such a wide range of graphic tools as do mass circulation magazines.

The educational publisher

What role does the traditional educational publisher play in all this? Partnerships and agreements between traditional publishers and distance learning institutions are possible and often desirable. There is now growing co-operation between book publishers and large educational institutions. Publishers of educational material also play an active role in generating the content, and are innovative in marketing.

❶ There has been much use made of market research by the big textbook publishers in the United States. Their extensive research into college syllabi, their field trials and their use of critiques by experienced and influential teachers, allows them to design books which can be guaranteed in advance to meet the requirements as course-books for leading institutions.

Much of the writing and transforming work for such books are done in-house by the publishers themselves, thus achieving a closer fit between writing, production and marketing.

Related to this is the 'mix-'n-match' idea, where a range of chapters is kept on computer, and a selection made, together with some of the instructor's own notes, for each institution that chooses the work as a course-book. This tailor-makes the book for the instructor. Course-books also carry satellites along with them, such as instructors' manuals.

❷ The world's foremost distance learning institution, the UK Open University, has introduced a system of collaborative publishing after twenty years of publishing its own materials. In this new mode, the OU writes and transforms its own teaching material as it did before, then offers commercial publishers the chance of adding the material to their lists as books available for open sale in bookstores.

Once a deal is struck the OU then gets shared costs, economies of scale and some enhanced quality (for example, a more frequent use of second or four-colour printing). As copyright holder, the University earns royalties, and arranges buy-back of copies for its own students. So far the idea has given benefits to both sides, and in some cases the published books have sold extraordinarily well for academic material.

❸ Much publishing is done on topics that are truly educational, but are not offered in formal educational establishments. In this field part-work publishers and book packagers are very active. They put capital into the authoring and transforming stages and are astute at tailoring the material to a market.

Book packagers develop multi-language versions which they sell on for marketing to publishers in other countries.

Developmental testing, revision & evaluation

It has always been an ideal of educational technology that instruction should be modified as data on learner performance became available, until courses deliver in practice the objectives that have been promised in theory. This, the systematic approach to instruction, criticised the ineffectiveness of traditional education, and proposed ways and means of improving the situation (Macdonald-Ross 1973).

The part of this systematic approach philosophy which is relevant here is its emphasis on the revision of courses based on the actual performance of learners, as well as any content improvements that the passage of time may bring to light. I am not so much concerned here with what Scriven called formative evaluation (which we at the OU call developmental testing) as with what happens after the course is actually in the field with real students.

What the new production methods do is make the process of *continuous improvement* simple and economic:

❶ the process of revision and reprinting is now almost entirely in-house, that is, under the direct control of the institution.

❷ revision can be done on-line regularly as information about the course becomes available.

❸ the manufacturing process is, in general, much faster and cheaper than it was with the old technology. If a modern in-house document copier is used the increase in speed and reduction in costs over conventional print is dramatic.

❹ to take advantage of the technology, the process of course maintenance must be change to course improvement, so that each year the course is a subtly new creature, constantly improving and adapting rather than remaining static and gradually getting out-of-date.

Evaluation in the context of the systematic approach is somewhat problematical. On the one hand a course is to be judged by whether or not it enables learners to achieve pre-set objectives, but on the other hand a course may have unintended consequences which turn out to be of significance(see Guba & Lincoln 1989 for a broad view).

However, such questions need not divert the progress of continuous improvement. It is necessary to get the microstructure of a course working properly, and for the course to improve. This is what the new technology facilitates.

Ergonomics of use

There are a number of questions, usually ignored in reference works, which make up the practical ergonomics of use by the learner. The size & weight of texts, the format, binding and choice of paper are some of these factors. Perhaps the most under-rated of all print topics is the way books are handled and used by the reader. Here are some considerations:

1 Legibility The past decade or two has seen a tendency for some educational material to be published with inferior typography, leading to reduction in legibility. The cause of this may be sheer ignorance, or a by-product of technological change, but perhaps more often it is due to false economy by publishers, many of whom do not employ professional typographers as they once might have done.

It cannot be said too often that the most important single requisite of book production is now, as always, good legibility.

2 Ease of handling Weight, size, and ability to open flat are important.

Heavy books affect portability and handling quality; this in turn reduces the readers' options as to where study takes place. One Open University coursebook weighs 2½ kilograms, with more than a thousand pages! This is awkward in the hand and difficult to carry about; clearly not a sensible weight from the user's point of view.

Whilst it is difficult to set hard-and-fast limits, educational material bound in one volume should generally be under 500 gms, with 750 grams as a suggested upper limit. In putting this guideline into practice the choice of paper is critical: there is often a tension between the need for lighter paper and the need for opacity to reduce show-through.

When faced with huge and weighty course texts students might be well advised to take a tip from Charles Darwin. He used to take a binder's knife to the spine of large books and separate them into three or four sections of modest size, then wrote notes on them.

Binding affects ease of opening: where books don't open flat two hands must be used to hold it open, or alternatively the spine must be savagely handled to enforce its opening.

3 Format One thing that separates traditional from in-house publishing is the format. Overwhelmingly, in-house publishing uses international page sizes, especially A4.

This choice is rather awkward from the point of view of the reader. The measure of type across the A4 page is rather too long for good legibility if a single column layout is used. Also, the size is not convenient in the hand (that is important, as it affects frequency of use).

In a bookshop, A4 often needs shelving apart from the usual book sizes; it does not sit comfortably on the standard shelf size – indeed A4 books often can't stand up unaided on a shelf. These things can be important for a bookshop. Commercial publishers generally choose a smaller format except for highly illustrated works.

However, a two or three-column layout can work well on A4 (it shortens the measure to acceptable dimensions). There are even some advantages to A4; for example, it is good for highly illustrated works; and in production most machines have an A4 setting.

In general, the ergonomics of use are more important than the convenience of the producer, and from that point of view A4 should not be the first choice. The international range of paper sizes does offer more acceptable options. A5, half the size of A4, is excellent ergonomically, rather similar to demy 8vo in size. Also there is the international B series, which offers B5, a size somewhat larger than A5. In commercial book publishing, the traditional page sizes are more usual.

In general, *large size* may cause problems on a desk when room is needed for other sources and notebooks; in particular, landscape format is always apt to cause difficulties on a crowded desk. Large size also affects portability and ease of handling away from the desk. There is a tendency nowadays for page size to get larger, perhaps to accommodate increased use of illustrations, but often for no good reason.

4 Durability It is famously true that educational material is hard used, often very hard used. Yet, for relatively minor savings in production cost, educational material is all too often given the least durable binding.

What should be avoided is the kind of 'perfect binding' which results in a shower of pages onto the floor after a short period of hard usage. This kind of binding, in which separate sheets of paper are attached by little more than PVA (poly-vinal adhesive) is quite inappropriate for educational material.

Much superior is the traditional method where sewn sections allow ease of opening, yet are very durable. Advanced document copiers now offer taped hot-melt binding as an option; first experience suggests this is an improvement on older forms of perfect binding, though not so durable as sewn sections.

Other factors in durability are the cover – soft covers, if chosen, must be able to stand up to wear & tear – and the paper. Popular paperback publishing tends to use small type on paper that browns and becomes friable, and perfect binding; obviously such books are less legible and durable than we might wish.

On the other hand, expensive reference works may now be printed on acid-free paper, and sewn and bound securely, thus enhancing their potential life. Some reference works are available as compact disks, satisfactory so long as the amount of reading required is minimal.

5 Packaging The options available for binding and packaging are increasing. Much educational material is marketed as packs, which in effect means boxes, slip cases, folders, ring binders and other types of packaging. Inside the pack may be separate sheets, books, video and audiotapes, even computer disks.

Perhaps a third of the Open University courses use this sort of packaging (mostly in the non-undergraduate areas), and in the world of adult seminars and workshops almost all the material is in this form.

However, the traditional book is still a marvellously flexible teaching machine, and for the publisher still the most convenient vehicle for marketing. Soft vs hardback is not absolutely critical, except that soft covers need to be robust for educational use. The real choice is in the heart of the binding – how the pages are joined together. As I suggest above, sewn sections are traditionally the key element in a durable binding. However, for special purposes other types of binding may be preferred: there is a widespread use of spiral binders and ring binders for computer manuals (though softback books with sewn sections do lie flat and are durable).

The option of printing on demand, mentioned earlier under *laser printing*, requires caution. Printing on demand makes use of a kind of binding by document copier of which we have at present limited experience (see above, under *durability*). Yet it is fast and economical, and so for some purposes it will be ideal.

Poor decisions in the ergonomics of book production are a frequent source of problems for the reader.

New media

We are all aware that text nowadays can be presented on-screen rather than printed. This has the virtue that the text might be united with other modalities. One can unite text with film or cartoon, or text with computer simulation without moving from the personal workstation. One can also make use of data bases and telecommunication facilities.

However, text on computer screen does have some serious deficiencies. Computer-based presentation of text will not get used regularly in education without solutions being found to at least two critical problems:

❶ Ergonomically, screen text is a poor second-best to printed text. Text on screen lacks legibility and is hard to access at speed. And, obviously, screens are less portable than books.

❷ Multi-media screen-based systems are expensive to produce and expensive to make available to the learner.

Both these factors have been seriously underestimated by some computer technologists whose understanding of typography and the reading process is minimal, and whose appreciation of the practical economics of mass education at a distance is negligible. In general, educational planners should be sceptical about claims that the bulk of distance education can be delivered on non-text media. Print is still the central medium of education, and will be for a long time to come the most cost-effective and appropriate way of delivering education to large numbers of people at a distance.

The reasons for the centrality of print in education lie in the way knowledge is represented and com-

municated (at any rate, the kind of knowledge usually involved in formal learning), in the economics of print as compared with other media, and in the psychology and ergonomics of learning from print as compared with other media.

Having said that, other media can and should be used as partners to print. Even the older audio and televisual media can make dramatic and valuable contributions, and no doubt some of the promise of new computer media will eventually be realized. Many courses do require experimental work (we give science students home experimental kits and summer schools), or projects or work on computers. But claims to the effect that 'the day of the book is over' are seriously wrong; anyone tempted to believe this sort of thing should remember what happened to the 'paper-free office'!

Even though the computer revolution has dramatically changed the way print is produced, and has created new media, and new combinations of media, the printed text is *still* the key medium for distance education, and will remain so for the foreseeable future.

Motivation of the reader

It is a sad but true observation that much printed educational material is rather unappealing to all but the dedicated. It often fails in one of the basic aims of communication: to arrest the subject's attention, to arose his or her interest, and to encourage the subject to read on.

It must therefore be a major objective of textual development and production to use all means available to help produce material that motivates the reader. In this struggle the new technology can sometimes assist.

❶ the choice of topic: here relevance to the reader's interest is crucial, and print technology can do little to help the writer.

❷ the writing process: technology is only of minimal help in the effort to produce vivid, clear prose, though it can help with the more mechanical aspects of writing (see Frase 1987 for a review).

❸ graphics: computer technology makes it a simple matter to present graphics on the page, and to organize the arrangement of text on the page for maximum effect.

❹ colour: one visible result of new technology is the great increase in colour printing in recent years in magazines, newspapers and textbooks. Readers of mass media publications now expect colour as the norm, a trend which is likely to continue, as it did in film and television.

Second colour in educational texts is now the norm in countries with easy access to the new technology. Full colour (four or five-colour printing) is still not widespread in education except for special purposes.

Much more could be said, of course, on the subject of motivation: distance learning systems succeed as much by the motivation of their students as by the excellence of their teaching

Benefits of modern production methods

What are the benefits that modern production methods have brought about? Opinions vary, but items on the list include:

❒ improved speed of production once the methodology is mastered.

❒ reduction in costs.

❒ improved control over details.

❒ easy updating, printing on demand, general flexibility.

❒ improved quality through better interaction between creative staff.

❒ offers female employees better opportunities for employment.

❒ ability to match texts to specific readers or clients.

❒ increasing use of colour and graphics at economic rates.

Staff development

Staff development is a pressing need of the moment. The changes in technology have caused profound changes in working methods. It takes time to learn how to get the most from the software, and it takes time to get used to the new working methods.

This is not all: the software is now often in the hands of staff who do not have enough background in editing, the graphic arts and typography. This is understandable, since few organizations are able to employ in-house the kind of expertise once found only in top-class publishing houses or magazines.

All this leads to some fundamental questions:

❒ How to give staff some of the skills of editing, design & typography that once took half a lifetime to learn? Training and updating in computer software is also a permanent problem these days. In these fields short courses are only part of the solution: there is a big difference here between *acquaintance* and *mastery*.

❒ The next question is how should these renaissance communicators combine in work-teams and operate to schedule to produce a quality product?

One key idea is that work-teams doing the transforming (see above) should work together in one

area, perhaps a large room on a linked group of terminals so as to encourage synergy and teamwork. This is a practice already followed by some highly successful production groups.

❒ Another problem is how to negotiate the changes in working practice in what was a highly trade-unionized setting. The adoption of in-house publishing has made it easier to evade the problem of long-standing craft and union differences.

❒ How best to use specialist consultants in typography, design and computer software is another issue facing management.

One cannot give pat solutions to these problems, but knowing the problems exist is itself an advance.

Some further reading

Amato J 1992 Science-literature inquiry as pedagogical practice: technical writing, hypertext, and a few theories; parts I & II. *Computers and Composition* 9: 2, 41-54; 55-69.

Carlson PA 1991 Virtual text and new habits of mind. In H Maurer (ed) *New results and new trends in computer science*. Springer-Verlag, Berlin.

Duffy TM & Waller R (eds) 1985 *Designing Usable Texts*. Academic Press, Orlando FLA & London.

Febvre L & Martin J-P 1976 *The Coming of the Book: the impact of printing 1450-1800*. NLB, London. [transl. of *L'Apparition du Livre*, Editions Albin Michel, Paris 1958.]

Frase LT 1987 Creating Intelligent Environments for Computer Use in Writing. *Contemporary Education Psychology* 12, 212-221.

Gottschall EM 1989 *Typographic Communications Today*. MIT Press, Cambridge MA.

Guba EG and Lincoln YS 1989 *Fourth Generation Evaluation*. Sage Publications, Newbury Park CA and London.

Hartley J 1992 *Technology and Writing: readings in the psychology of written communication*. Jessica Kingsley Publishers, London & Philadelphia.

Jeavons T & Beaumont M 1990 *An Introduction to Typography*. Apple Press, London.

Macdonald-Ross M 1973 Behavioural Objectives - a critical review. *Instructional Science* 2, 1-52.

Macdonald-Ross M & Waller R 1976 The Transformer. In S Greenwood and C Goodacre (eds) *The Penrose Annual* 69: 141-152. Northwood, London.

Sharples M (ed) 1993 *Computer Supported Collaborative Writing*. Springer-Verlag, Berlin.

Tuman M 1992 *Word Perfect: literacy in the computer age*. Falmer Press, London.

Wallis LW 1990 *Modern Encyclopedia of Typefaces 1960-90*. Lund Humphries, London.

Whalley P 1993 An alternative rhetoric for hypertext. In C McKnight, A Dillon & J Richardson (eds) *Hypertext: a psychological perspective*. Ellis Horwood, Chichester.

[Anon] 1991 The London Evening Standard: complete PostScript newspaper. *Seybold Report on Publishing Systems* 21: 2, 3-17. The Seybold Report is an important source for news on print technology: Seybold Publications Inc. PO BOX 644, Media, PA 19063 USA.